impede rather than help the final solution. Real progress in this case can only be achieved through patient, well-considered, and persistent effort that will gradually give us what we want; namely, clean, fresh and safe milk."

The various chapters treat of general considerations, milk as a food, dirty milk, diseases caused by infected milk, clean milk, pasteurization, infant mortality, and the commercial aspect which deals with farmer, retailer, and consumer. An excellent list of references is given, although it is to be regretted that no mention is made of the recent admirable contributions to the subject made by Professor E. O. Jordan of the University of Chicago. A few criticisms might be made but they would seem like quibbles in the light of the general excellence of the book.

The conclusions of Dr. Rosenau may well be quoted, viz.:

THE SOLUTION OF THE MILK PROBLEM

To keep milk clean we need inspection. To render milk safe, we need pasteurization.

Inspection goes to the root of the problem. Through an efficient system of inspection, the milk supply should be cleaner, better, fresher, and safer. Inspection, however, has limitations. These limitations may be guarded against by pasteurization.

A milk supply, therefore, that is both supervised and pasteurized is the only satisfactory solution of the problem.

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Heredity and Eugenics. A Course of Lectures Summarizing Recent Advances in Knowledge in Variation, Heredity, and Evolution and Its Relation to Plant, Animal, and Human Improvement and Welfare. By WILLIAM ERNEST CASTLE, JOHN MERLE COULTER, CHARLES BENEDICT DAVENPORT, EDWARD MURRAY EAST, and WILLIAM LAWRENCE TOWER. Chicago: The University of Chicago Press, 1912. Pp. vii+315.

This volume presents a series of nine lectures on evolution and heredity which were delivered at the University of Chicago during the summer of 1911. The lectures were intended to inform those who are not specialists in biology, and they are for the most part reasonably popular expositions of their topics.

Professor Coulter, in the introductory lecture, "Recent Developments in Heredity and Evolution," sketches the history of the conceptions of evolution and heredity, and thus presents the background for the more special lectures which follow. His treatment of the explanations of evolution, of biometry, and of heredity are brief and to the point.

In the second of his two lectures, Professor Coulter discusses "The Physical Basis of Heredity and Evolution from the Cytological Standpoint." After certain introductory remarks concerning the phenomena of heredity, he describes admirably the several methods of reproduction in plants, concluding with the statement:

> The whole history of sexual reproduction among plants indicates that its primary significance is not reproduction, for probably many more individuals are produced by vegetative multiplication and by spores than by the sex act. This would mean that the sexual method is chiefly concerned with other results, which are secured in connection with reproduction. These results seem to be the continual securing of new combinations, and new combinations certainly make for evolutionary progress [p. 35].

This idea is doubtless new to many persons who are keenly interested in the phenomena of heredity.

In two lectures, Professor Castle deals with "The Method of Evolution" and "Heredity and Sex." Under the first title, he contrasts the Darwinian view of species production with the more recent Mendelian view. After presenting certain of the essential facts of Mendelism, he proceeds to show that it is possible by selection to produce new types of organism.

His attitude toward the two schools of evolutionists, which he chooses to contrast, is well indicated by the following statements:

> Now I am inclined to think that Darwin was on the whole nearer the truth than the mutationists. They have perceived a half-truth and perceived it more clearly than did Darwin, but in scrutinizing this they have lost sight of the larger picture which he saw. Darwin saw that new races arise in two ways, and I shall attempt to show that he was right [p. 40].

In concluding the chapter, Professor Castle writes significantly thus:

> From the evidence in hand we conclude that Darwin was right in assigning great importance to selection in evolution; that progress results not merely from sorting out particular combinations of large and striking unit-characters, but also from the selection of slight differences in the potentiality of gametes representing the same unit-character combinations.
>
> Accordingly we conclude that the unit-characters are not unchangeable. They can be modified, and these modifications come about in more than a single way. Occasionally a unit-character is lost altogether or profoundly

modified at a single step. This is mutation. But more frequent and more important, probably, are slight, scarcely noticeable modifications of unit-characters that afford a basis for a slow alteration of the race by selection. Mutation, then, is true, but it is a half-truth; selection is the other and equally important half of the truth of evolution, as Darwin saw it and as we see it [p. 61].

The discussion of heredity and sex is limited to remarks on the history of our knowledge of sex determination and to an admirable presentation of the results of recent experimental studies of this subject.

The discussion is summarized thus in the concluding paragraphs of the lecture:

If, as has been suggested, the determination of sex in general depends upon the inheritance of a Mendelian factor differentiating the sexes, it is highly improbable that the breeder will ever be able to control sex. Male and female zygotes should forever continue to be produced in approximate equality, and consistent inequality of male and female births could result only from greater mortality on the part of one sort of zygote than of the other. Only in parthenogenesis can man at will control sex, and until he can produce artificial parthenogenesis in the higher animals, he can scarcely hope to control sex in such animals.

Negative as are the results of our study of sex control, they are perhaps not wholly without practical value. It is something to know our limitations. We may thus save time from useless attempts at controlling what is uncontrollable and devote it to more profitable employments [p. 79].

The lectures of Professor East are devoted to "Inheritance in the Higher Plants" and "The Application of Biological Principles to Plant Breeding." He describes at some length the Mendelian behavior of organisms, and in concluding his first lecture he briefly discusses Johannsen's "genotype conception of heredity." His attitude toward this conception is thus expressed:

One may question the stability of unit-characters as does Castle, but I cannot see how this affects the truth of the genotype conception as a help toward an idea of the process of heredity. Stability is a relative thing. . . . . The important point as the foundation of the modern view of heredity I give in Johannsen's own words: "Personal qualities are the *reactions of the gametes joining to form a zygote;* but the nature of the gametes is not determined by the personal qualities of the parents or ancestors in question [p. 112].

In his lecture on applications, Professor East ably discusses the importance of hybridization in plant breeding, basing his arguments chiefly upon results obtained with maize and tobacco.

A single lecture given by Professor Tower appears in the volume as an extended discussion of "Recent Advances and the Present State of

Knowledge concerning the Modification of the Germinal Constitution of Organisms by Experimental Processes." This single lecture, in its printed form, occupies 125 pages, and it is the only chapter of the book whose appearance is likely to repel the layman. In spite, however, of its technical appearance and its somewhat detailed presentation of experimental facts, it is an eminently readable and valuable contribution.

Professor Tower has with admirable system and skill discussed the several important aspects of modification of the germinal cells by extra-germinal conditions. The problem, as he states it,

> is to produce "somatic variations" in a soma at such a time, or in such a fashion, that the germ cells will not be affected by the *action of the incident forces used*, and then by breeding discover if the change appears in the progeny arising from the unstimulated germs. Evidence of somatic influence upon germinal material may also be obtained by transplanting germ glands, especially ovaries, into different somas, as has been done by several experimenters [p. 146].

Under the heading of "The Direct Modification of the Germ Plasm," DeVries' observations on *Oenothera* are described with numerous and excellent illustrations. But the lecturer illustrates most of his points from his own extended study of the potato beetle.

To the student of heredity, Professor Tower's lecture is sure to be the most stimulating of this group, for it suggests innumerable problems and opens up new vistas of research.

The concluding lectures of the volume are those of Professor Davenport on "The Inheritance of Physical and Mental Traits of Man and Their Application to Eugenics" and "The Geography of Man in Relation to Eugenics." Like the other lecturers, with the possible exception of Professor Tower, Professor Davenport has made no attempt to offer new materials in these lectures. His is a popular exposition of the facts of heredity in man with strong emphasis upon their social bearings.

In the first lecture, he presents, with conciseness, and convincingness, evidence of the transmissibility of a variety of physical and mental characters in man. The list includes such characters as presenile cataract, diabetes, albinism, deaf-mutism, feeble-mindedness, artistic ability, and color-blindness.

In the second lecture, are presented many interesting facts concerning the relation of geographical distribution and physiographic barriers to heredity and eugenics. Thus it is shown that rivers and mountain ranges may have much to do with the development of desirable or undesirable characteristics in a community. Isolation is singled out as an important condition of race deterioration.

But a still more interesting portion of this lecture, which seems to the reviewer of extreme eugenic value, deals with "The Influence of the Single Germ Plasm on the Race." Under this title, are described the family of Elizabeth Tuttle, certain of the first families of Virginia and of the Kentucky aristocracy, and finally, by way of contrast, the Jukes family, and the Ishmaelites.

All who are socially minded will sympathize with Professor Davenport and find deep significance in his exclamation: "Ah, that, in the hordes pressing at the gate at Ellis Island, we could distinguish the John Prestons from the Ben Ishmaels of the future!" (p. 308).

This, the final lecture of the volume, is concluded by a concise history of the eugenics movement in America.

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Early Man in South America. By ALEŠ HRDLIČKA (in collaboration with W. H. HOLMES, BAILEY WILLIS, FRED EUGENE WRIGHT, and CLARENCE N. FENNER). Bulletin 52. Bureau of American Ethnology. Washington: Government Printing office, 1912. 8vo, pp. xv+405.

For a long time past, a claim for man's great antiquity in South America has been made. The earlier evidence presented came from Brazil, the later from Argentina. That from Brazil, though presented on fair authority, has always been shaky and insecure; that from Argentina, on account of its mass, its diversity, its geographical range, its presentation by a man with reputation as a palaeontologist, has gained considerable consideration and has been accepted by some European authorities of weight. The man to whom we chiefly owe the Argentinan claim is Florentino Ameghino. He has proposed a classification of geological formations running back from modern time to the Upper Eocene, from which, at various levels, he has secured industrial vestiges, human remains, and the remains of man's precursors. As the result of finds already made, he has developed a scheme of human evolution which has been widely quoted. He claims that remains have been discovered, not only of several species of man besides *Homo sapiens*, but also of at least two genera of man's precursors. He has introduced the names *Homo Caputinclinatus*, *Homo sinemento*, *Homo pampaeus* (=*Prothomo*), *Diprothomo platensis*, *Tetraprothomo argentinus* for his new forms. By the term *Prothomo*, he means a form one step removed